

# Compton Scattering

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October 15th , 2010

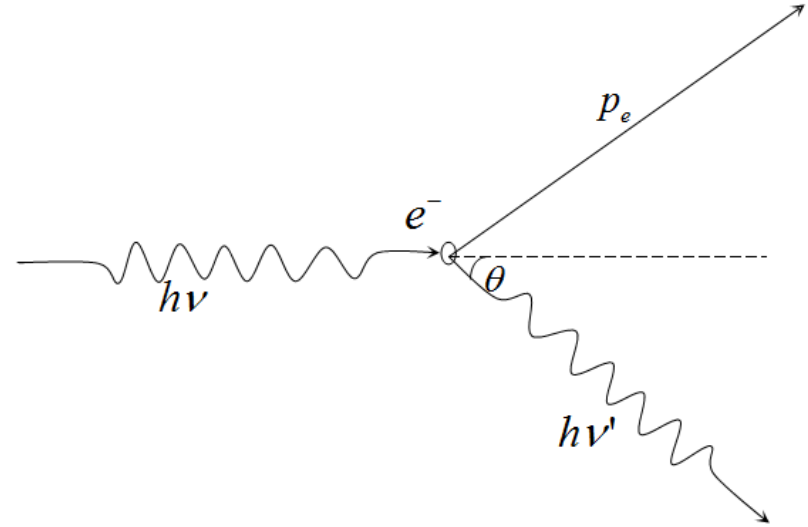
# Outline

- Theory of Compton Scattering
- Facility
- Process
- Result and Summary

# Compton Scattering

Kinetic Description:

$$h\nu' = \frac{h\nu}{1 + \gamma(1 - \cos \theta)}, \gamma = \frac{h\nu}{m_e c^2}$$

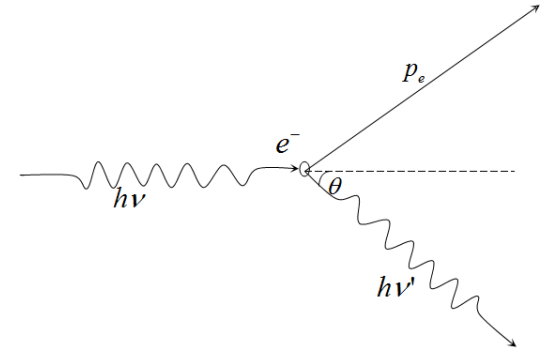
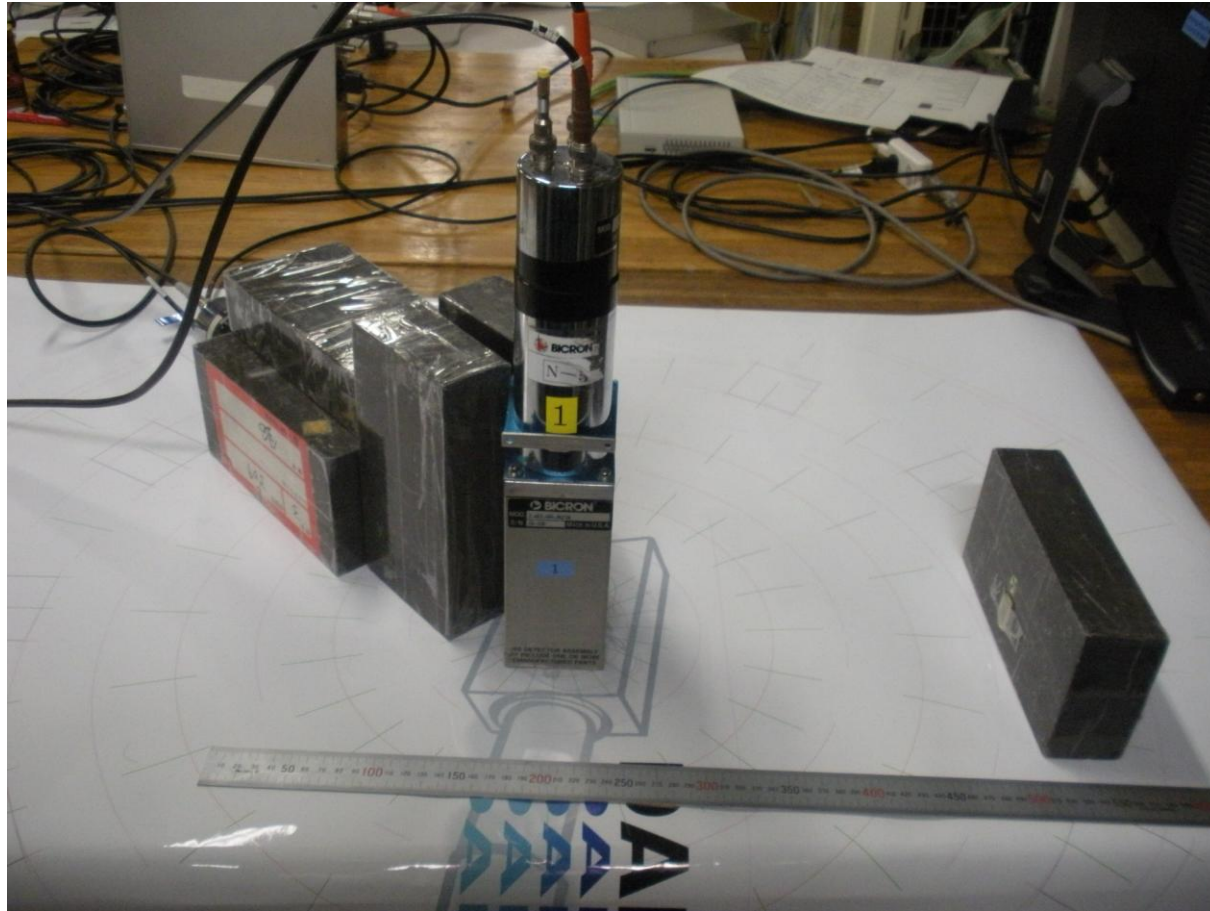


Dynamic Description:

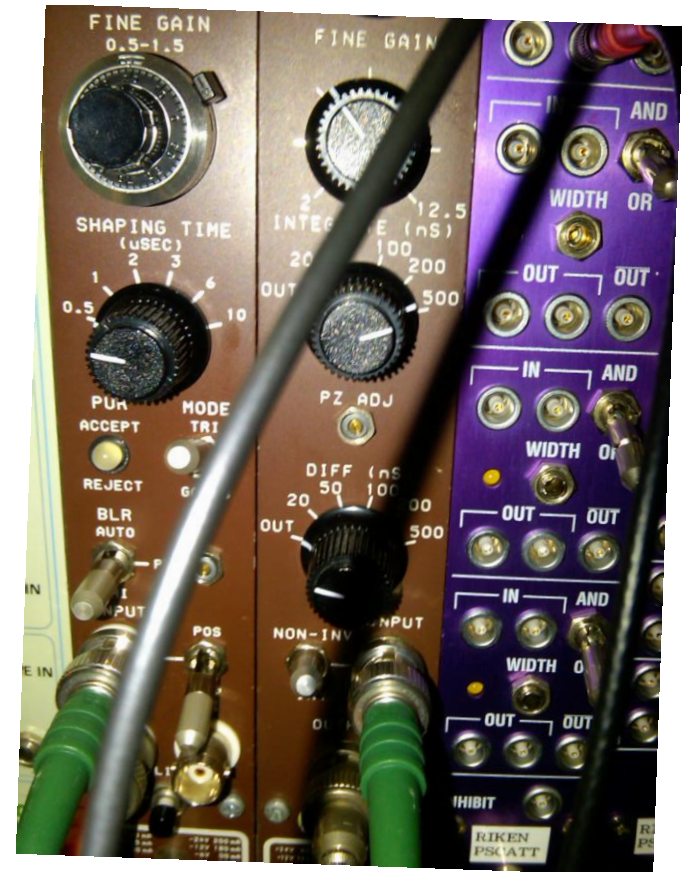
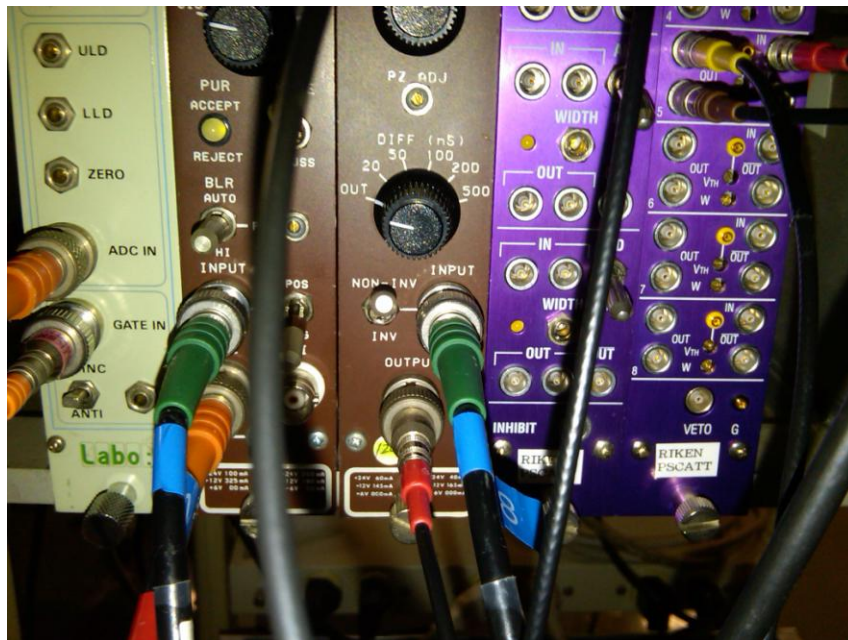
$$\frac{d\sigma(\theta)}{d\Omega} = \frac{r_e^2}{2} \cdot \frac{1 + \cos^2 \theta}{[1 + \gamma(1 - \cos \theta)]^2} \cdot \left\{ 1 + \frac{\gamma^2 (1 - \cos \theta)^2}{(1 + \cos^2 \theta)[1 + \gamma(1 - \cos \theta)]} \right\}$$

Klein-Nishina formula

# Facility of our experiment

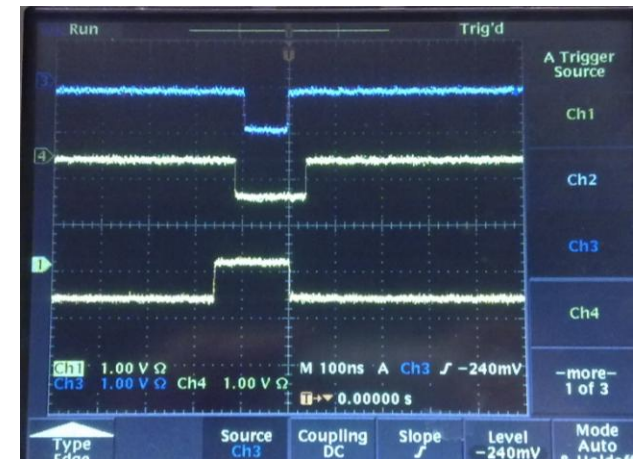
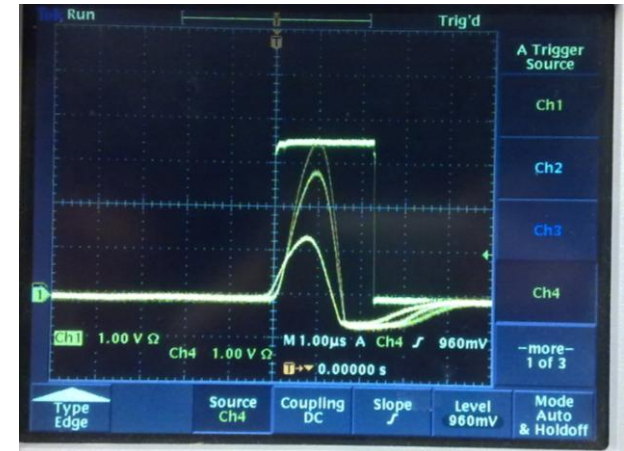


# moduals

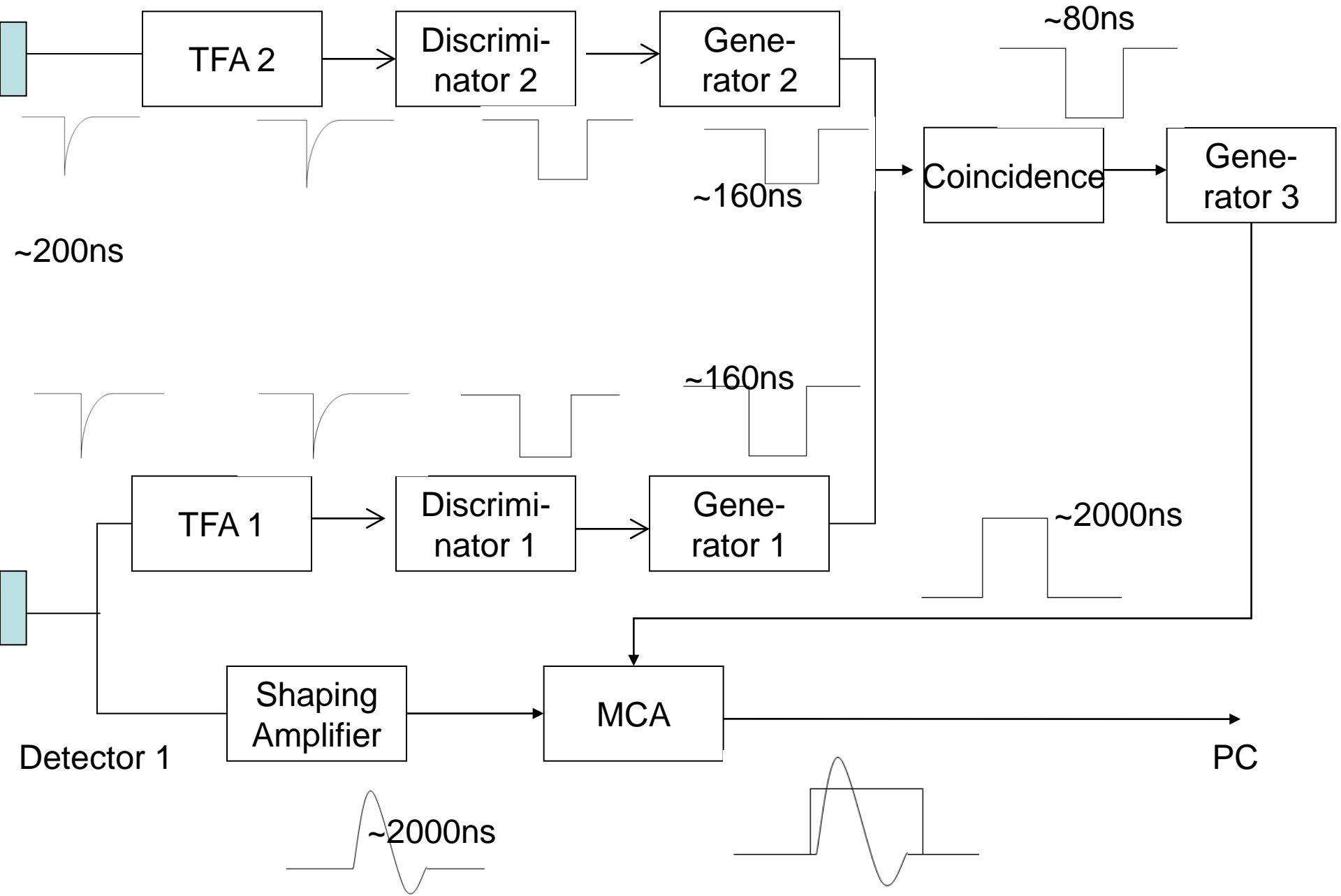


# Process

- Calibration ( $^{22}\text{Na}$ ,  $^{137}\text{Cs}$ )
- Observe the original signal on oscilloscope
- Construct the coincidence circuit
- Check the coincidence\*
- Date taking

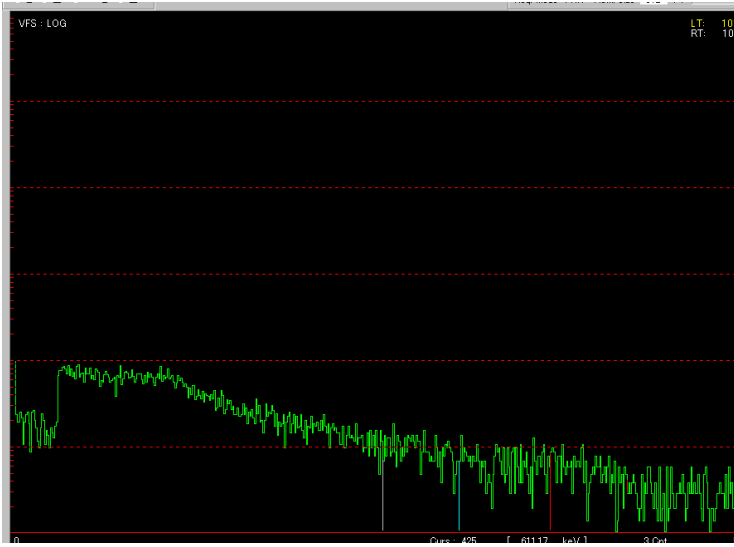


Detector 2



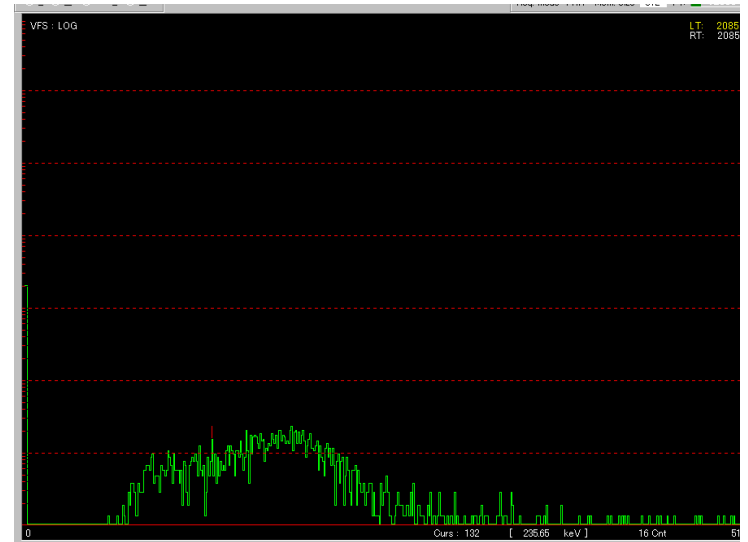


no coincidence



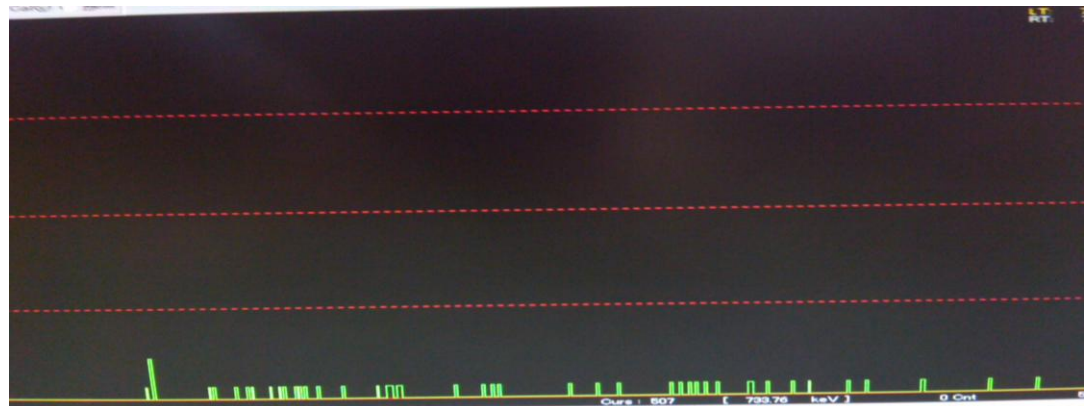
truetime=101 s

after coincidence



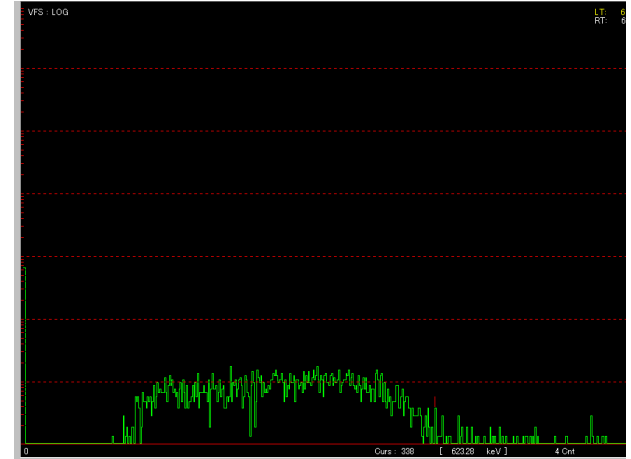
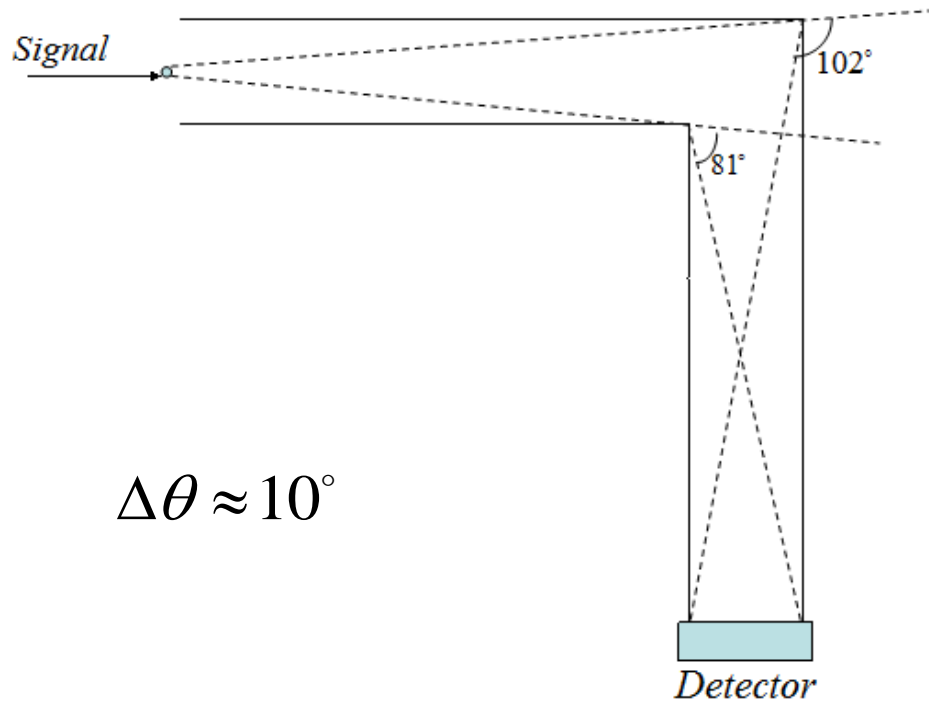
truetime=2045 s

background





# Uncertainty of angle measurement

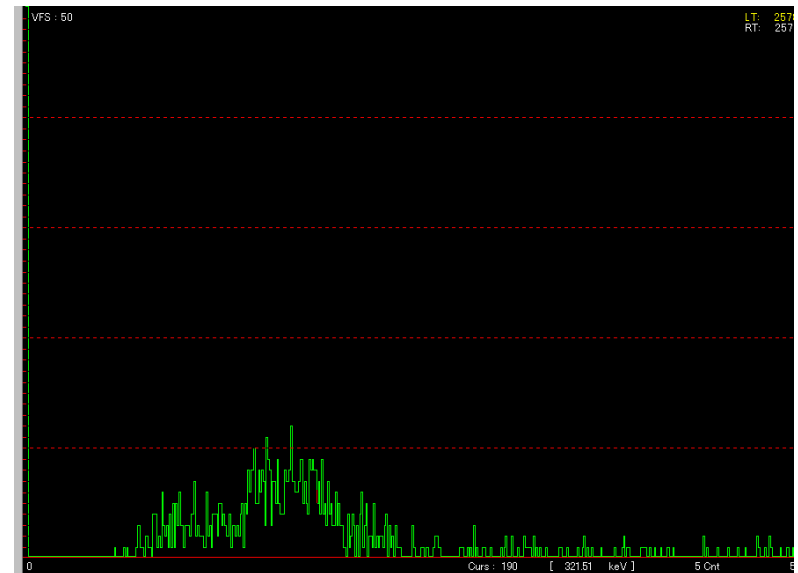


$$N_{\text{compton}}(\theta) = \frac{d\sigma}{d\Omega} \cdot N_{\gamma} \cdot N_e \cdot \Delta\Omega$$

$$\frac{d\sigma(\theta)}{d\Omega} = \frac{r_e^2}{2} \cdot \frac{1 + \cos^2 \theta}{[1 + \gamma(1 - \cos \theta)]^2} \cdot \left\{ 1 + \frac{\gamma^2 (1 - \cos \theta)^2}{(1 + \cos^2 \theta)[1 + \gamma(1 - \cos \theta)]} \right\}$$

# Result

$\theta$	50	90	120
E/KeV	422	296	232
$\Delta E/\text{KeV}$	135	92	124



thanks